

CLAIMS

1. A retractor for a seat belt comprising:

a spindle on which a webbing is wound;

5 a frame for pivotally holding the spindle;

a drawing prevention section for preventing the webbing from drawing such that:

stopping a rotation of the spindle rotating in a drawing out direction, in which the webbing is drawn out, when a rotational acceleration of the spindle is not less than a predetermined value when the webbing is accelerated in the drawing out direction; and

stopping a rotation of the spindle rotating in the drawing out direction when a deceleration of a vehicle is not less than a predetermined value; and

a first power generating section which generates power to rotate the spindle in a winding direction in which the webbing is wound, and connected to the spindle at all times so as to transmit the generated power to the spindle;

20 a second power generating section which generates power to rotate the spindle in the winding direction; and

a power transmitting mechanism section which transmits the power generated by the second power generating section to the spindle, wherein

the power generated by the first power generating section is made to be lower than the power generated by the second power generating section, so as to maintain a rotary speed of the spindle generated by the first power generating section to be lower than a rotary speed of the spindle generated by the second power generating section, and the second power generating section is used repeatedly.

2. The retractor for the seat belt according to claim 1, wherein the first power generating section generates power by a rotary spring force of a spiral spring, and the second power generating section generates power by torque of a motor.

3. The retractor for the seat belt according to claim 1, wherein when the second power generating section generates the power for rotating the spindle in the winding direction, the power transmitting mechanism section transmits the power generated by the second power generating section to the spindle, and

when the second power generating section generates the power for rotating the spindle in a direction opposite to the direction in which the second power generating section generates power for rotating the spindle in the winding direction, the power transmitting mechanism section does not

transmit power generated by the second power generating section to the spindle.

4. The retractor for the seat belt according to claim 1 or 2, wherein a power setting is made in advance in the first power generating section so that a predetermined tension is generated in the webbing when a seat belt user fastens the seat belt.

5. The retractor for the seat belt according to claim 1 or 3, wherein the power transmitting mechanism section includes a power transmission cushioning section for cushioning a power transmission by an elastic member arranged between the second power generating section and the spindle,

wherein when the power of the second power generating section is transmitted to the spindle, a sudden change in the power of the second power generating section is not transmitted to the spindle as a sudden change in power, and

when the power of the second power generating section is transmitted to the spindle, a sudden force in a direction of drawing out the webbing given to the spindle, which is generated when a seat belt user gives a sudden force to the webbing in the drawing out direction, is not transmitted to the second power generating section as a sudden change in

force.

6. The retractor for the seat belt according to claim 5,
wherein an elastic force of the elastic member in the power
transmission cushioning section is larger than the force
5 generated by the first power generating section.

7. The retractor for the seat belt according to any one of
claims 1 to 6, further comprising:

a webbing action detecting section for detecting
10 whether the webbing is drawn out, the webbing is wound or
the webbing is in a stopping state; and

a control section for controlling the power of the
second power generating section according to:

whether or not the seat belt is fastened which is
15 detected by a seat belt fastening detection section which is
integrated into a buckle and detects whether or not a tongue
is engaged with the buckle, and

an action of the webbing detected by the webbing
action detecting section.

20
8. The retractor for the seat belt according to claim 7,
wherein when the seat belt fastening detecting section
detects a change from a state of fastening the seat belt to
a state of not-fastening the seat belt, in a case where the
25 state of not-fastening the seat belt is detected and the

seat belt fastening detecting section detects that the webbing is in a stoppage state, the control section makes the second power generating section generate a predetermined intensity of the power for rotating the spindle in the winding direction.

9. The retractor for the seat belt according to claim 7, wherein when a state of not-fastening the seat belt and a state of drawing out of the webbing are detected, in a case where a state of not-fastening of the seat belt and a state of a stoppage of the webbing are detected, the control section controls so that the second power generating section generates a predetermined intensity of the power for rotating the spindle in the winding direction.

10. The retractor for the seat belt according to any one of claims 7, 8 and 9, wherein when a state of not-fastening the seat belt and a state of stoppage of the webbing are detected although the power of rotating the spindle is generated in the winding direction by an action of the second power generating section,

the control section stops the generation of the power by the second power generating section for a predetermined period of time, and then the control section controls to generate the power, a direction of which oppose to the

direction of the power for rotating the spindle in the winding direction.

11. The retractor for the seat belt according to any one of
5 claims 7, 8, 9 and 10, wherein when the change from the state of not-fastening the seat belt to the state of fastening the seat belt is detected, the control section makes the second power generating section generate the power for rotating the spindle in the winding direction, and
10 when the state of stoppage of the webbing is detected, the control section makes the second power generating section generate power, a direction of which opposes to the direction of the power for rotating the spindle in the winding direction for a predetermined period of time.

15

12. The retractor for the seat belt according to any one of claims 7 to 11, wherein the webbing action detecting section detects a rotation and a rotary direction of the spindle and when a change in amount of the rotation of not less than a
20 predetermined value is detected in a predetermined period of time and a rotation of the spindle is detected on a side of drawing out the webbing, the webbing action detecting section judges that the webbing is drawn out,

when the rotation of the spindle is detected on a side of winding the webbing, the webbing action detecting section judges that the webbing is wound, and

when a change in amount of rotation of not less than a
5 predetermined value is not detected in a predetermined period of time, the webbing action detection section judges that the webbing is in a state of stoppage.

13. The retractor for the seat belt according to one of
10 claims 7 to 12, wherein when a dangerous state detected by a dangerous state detecting section, which is separately provided and detects whether or not a vehicle is in a dangerous state, and a state that a user fastens the seat belt are detected, the control section makes the second
15 power generating section generate the power for rotating the spindle in the winding direction.

14. The retractor for the seat belt according to claim 13, wherein when the state of fastening the seat belt and the
20 change from the dangerous state of the vehicle to the not-dangerous state are detected,

the control section makes the second power generating section generate the power, an intensity of which is higher than an intensity of the power for rotating the spindle, in
25 the winding direction for a predetermined period of time;

and also makes the second power generating section gradually reduce the power with lapse of time; and after no power is generated, the control section controls so that a predetermined intensity of power for rotating the spindle is generated for a predetermined period of time in a direction opposite to the winding direction.

15. The retractor for the seat belt according to one of claims 1 to 6, further comprising a control section for controlling the power generated by the second power generating section according to a seat belt fastening state detected by a seat belt fastening state detecting section, which is incorporated into a buckle and detects whether or not a tongue is engaged with the buckle, and according to a dangerous state detected by a dangerous state detecting section for detecting whether or not a vehicle is in a dangerous state.

16. The retractor for the seat belt according to claim 15, wherein when the state of fastening the seat belt and the dangerous state of the vehicle are detected, the control section makes the second power generating section generate the power for rotating the spindle in the winding direction.

17. The retractor for the seat belt according to claim 15, wherein when the state of fastening the seat belt and the change from the dangerous state of the vehicle to the not-dangerous state are detected, the control section makes the second power generating section generate the power, an intensity of which is higher than an intensity described in claim 16, for rotating the spindle in the winding direction for a predetermined period of time; and then the control section makes the second power generating section gradually reduce the power with lapse of time; and after no power is generated, the control section makes the second power generating section generate a predetermined power for rotating the spindle in a direction opposite to the winding direction for a predetermined period of time.

18. The retractor for the seat belt according to claim 13 or 15, wherein when the dangerous state of the vehicle and the change from the state of fastening the seat belt to the state of not-fastening the seat belt are detected, the control section makes the second power generating section generate a predetermined power for rotating the spindle in the direction opposite to the winding direction for a predetermined period of time.

19. The retractor for the seat belt as set forth in any one of claims 8 to 11, wherein an intensity of the power for rotating the spindle in the winding direction generated by the second power generating section in any one of claims 13 to 18 is set to be higher than an intensity of power for rotating the spindle in the winding direction generated by the second power generating section.

20. The retractor for the seat belt according to any one of claims 3, 10, 11, 14, 17 and 18, wherein while the control section controls so that the second power generating section generates a rotary power in a direction opposite to the direction of winding the webbing with respect to the spindle and when an amount of the drawn webbing being not less than a predetermined value is detected by the webbing detecting section, the control section controls the second power generating section to increase a rotary speed.